

What is claimed is:

1. A fuel cell assembly comprising:
a membrane electrode assembly including a substantially solid polymer electrolyte membrane positioned between opposed catalyst layers, the polymer electrolyte membrane having
5 a dimension that is larger than a comparable dimension of at least one of the catalyst layers, such that the polymer electrolyte membrane has an uncovered portion; and
a gasket attached to the uncovered portion of the polymer electrolyte membrane, wherein the gasket extends beyond a periphery of the polymer electrolyte membrane and wherein the gasket is formed of a polymer material, said gasket being configured to substantially prevent
10 leakage of fuel or oxidant between an anode side and a cathode side of the membrane electrode assembly.
2. The fuel cell assembly according to claim 1, further comprising:
a thermoplastic adhesive, wherein the gasket is attached to the uncovered portion of the
15 polymer electrolyte membrane with the thermoplastic adhesive.
3. The fuel cell assembly according to claim 2, wherein the gasket and thermoplastic adhesive are integrally formed.
- 20 4. The fuel cell assembly according to claim 1, wherein the gasket has a height and the catalyst layers have respective heights, and wherein the height of the gasket is substantially equal to or greater than the respective heights of the catalyst layers.
- 25 5. The fuel cell assembly according to claim 1, further comprising:
an anode collector plate; and
a cathode collector plate,
wherein the anode collector plate and the cathode collector plate are attached to opposite
surfaces of the gasket.

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6. The fuel cell assembly according to claim 1, wherein the dimension of the polymer electrolyte membrane is larger than comparable dimensions of the opposed catalyst layers, such that the polymer electrolyte membrane has uncovered portions on both the anode side and the cathode side, and wherein a first gasket is attached to the uncovered portion of the anode side and a second gasket is attached to the uncovered portion of the cathode side.

7. The fuel cell assembly according to claim 6, wherein the first gasket and the second gasket are attached to each other beyond the periphery of the polymer electrolyte membrane.

8. The fuel cell assembly according to claim 1, wherein the polymer electrolyte membrane contains a plurality of uncovered portions around at least two ends of the polymer electrolyte membrane and wherein gaskets are attached to the plurality of uncovered portions on the at least two ends of the polymer electrolyte membrane.

9. The fuel cell assembly according to claim 8, wherein a first gasket and a second gasket are attached to each of the two ends of the polymer electrolyte membrane, and wherein the first gasket and the second gasket are attached to each other beyond the periphery of the polymer electrolyte membrane.

10. The fuel cell assembly according to claim 1, further comprising:
a containment chamber, wherein the containment chamber is at least one of attached to the gasket or integrally formed with the gasket.

11. The fuel cell assembly according to claim 1, further comprising:
a plurality of membrane electrode assemblies positioned in a substantially planar arrangement with respect to each other and wherein the gasket is attached to polymer electrolyte membranes of the plurality of membrane electrode assemblies.

12. The fuel cell assembly according to claim 1, further comprising:
a plurality of membrane electrode assemblies positioned in a stacked arrangement with respect to each other and wherein the gasket is attached to the polymer electrolyte membranes of adjacent ones of the membrane electrode assemblies.

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13. The fuel cell assembly according to claim 12, further comprising:
a housing containing the plurality of membrane electrode assemblies; and
one or more gaskets being attached to the housing.

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14. The fuel cell assembly according to claim 13, wherein the plurality of membrane electrode assemblies and the gaskets are configured to separate the housing into a fuel containment chamber and an oxidant containment chamber, and wherein the housing contains a fuel inlet and an oxidant inlet.

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15. The fuel cell assembly according to claim 14, wherein the anode sides of the plurality of membrane electrode assemblies face the fuel containment chamber and the cathode sides of the plurality of membrane electrode assemblies face the oxidant containment chamber.

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16. A method for substantially preventing leakage between fuel and oxidant in a fuel cell, said method comprising:

attaching a first polymeric gasket to a first side of a polymer electrolyte membrane of the fuel cell in a manner to cause the polymeric gasket to extend beyond a periphery of a first end of the polymer electrolyte membrane;

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attaching a second polymeric gasket to a second side of the polymer electrolyte membrane in a manner to cause the polymeric gasket to extend beyond the periphery of the first end of the polymer electrolyte membrane; and

attaching the first polymeric gasket to the second polymeric gasket at a location beyond the periphery of the first end of the polymer electrolyte membrane.

17. The method according to claim 16, wherein the steps of attaching the first polymeric gasket and the second polymeric gasket to the polymer electrolyte membrane further comprises adhering the first polymeric gasket and the second polymeric gasket to the polymer electrolyte membrane with a thermoplastic adhesive.

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18. The method according to claim 16, wherein the step of attaching the first polymeric gasket to the second polymeric gasket further comprises adhering the first polymeric gasket to the second polymeric gasket with a thermoplastic adhesive.

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19. The method according to claim 16, further comprising:
attaching a first current collector to a surface of the first polymeric gasket; and
attaching a second current collector to a surface of the second polymeric gasket, wherein the first polymeric gasket and the second polymer gasket functions as a spacer between the first current collector and the second current collector.

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20. The method according to claim 16, further comprising:
attaching an additional fuel cell component to at least one of the first polymeric gasket and the second polymeric gasket.

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21. The method according to claim 16, further comprising:
forming an additional fuel cell component from at least one of the first polymeric gasket and the second polymeric gasket.

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22. The method according to claim 16, further comprising:
positioning a plurality of fuel cells in a substantially planar arrangement with respect to one another;

attaching the first polymeric gasket to the first sides of the polymer electrolyte membranes of the fuel cells; and

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attaching the second polymeric gasket to the second sides of the polymer electrolyte membranes of the fuel cells, wherein the first polymeric gasket and the second polymeric gasket

operate to substantially prevent leakage between anode sides and cathode sides of the plurality of fuel cells.

23. The method according to claim 22, further comprising:
 5 attaching the first polymeric gasket to the second polymeric gasket in locations between the plurality of fuel cells.

24. The method according to claim 16, further comprising:
 positioning a plurality of fuel cells in a substantially stacked arrangement with respect to
 10 each other;
 attaching the first polymeric gasket to the first sides of adjacent fuel cells; and
 attaching the second polymeric gasket to the second sides of adjacent fuel cells.

25. The method according to claim 24, further comprising:
 15 providing a housing for containing the plurality of fuel cells;
 separating the housing into a fuel containment chamber and an oxidant containment chamber with the plurality of fuel cells, the first polymeric gasket and the second polymeric gasket; and

wherein the first sides of the fuel cells face one of the fuel containment chamber and the
 20 oxidant containment chamber and the second sides of the fuel cells face the other of the fuel containment chamber and the oxidant containment chamber.

26. A fuel cell assembly comprising: /
 means for supplying fuel to a membrane electrode assembly;
 25 means for supplying oxidant to the membrane electrode assembly;
 means for providing fuel containment between the fuel and oxidant in at least one area beyond a periphery of the membrane electrode assembly, wherein the means for providing fuel containment between the fuel and oxidant comprises a polymeric material; and
 means for attaching the means for substantially preventing leakage to the membrane
 30 electrode assembly.

27. The fuel cell assembly according to claim 26, wherein the means for providing fuel containment comprises means for supporting a plurality of membrane electrode assemblies in a substantially planar arrangement with respect to each other.

5 28. The fuel cell assembly according to claim 26, wherein the means for providing fuel containment comprises means for supporting a plurality of membrane electrode assemblies in a substantially stacked arrangement with respect to each other.

29. A fuel cell assembly comprising: /
 10 a first gasket layer and a second gasket layer attached to each other to form a cavity therebetween;
 a liquid electrolyte housed in the cavity formed between the first and second gasket layers, wherein the first and second gasket layers are configured to substantially prevent leakage of the liquid electrolyte from the cavity; and
 15 wherein the first and second gasket layers extend beyond a periphery of the liquid electrolyte, said gasket being configured to substantially prevent leakage of fuel or oxidant between an anode side and a cathode side of the liquid electrolyte.

30. The fuel cell assembly according to claim 29, further comprising:
 20 a first catalyst layer attached to a surface of the first gasket layer opposite the cavity; and
 a second catalyst layer attached to a surface of the second gasket layer opposite the cavity.

31. The fuel cell assembly according to claim 30, further comprising:
 an anode gas diffusion layer attached to a surface of the first catalyst layer; and
 25 a cathode gas diffusion layer attached to a surface of the second catalyst layer.

32. The fuel cell assembly according to claim 29, wherein one or both of the first gasket layer and the second gasket layer comprise holes to enable a flow of protons therethrough.

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33. The fuel cell assembly according to claim 32, further comprising:
a hydrophobic coating applied to the holes.

34. A method of manufacturing a fuel cell assembly, said method comprising:
5 supplying a first gasket sheet;
positioning a membrane electrode assembly (MEA) onto the first gasket sheet;
supplying a second gasket sheet;
positioning the second gasket sheet onto the MEA; and
applying pressure onto the first gasket sheet, the MEA, and the second gasket sheet to
10 adhere the first gasket sheet and the second gasket sheet to the MEA and to adhere the first gasket
sheet to the second gasket sheet in one or more locations beyond a periphery of the MEA.

35. The method according to claim 34, wherein one or both of the steps of supplying a
first gasket sheet and supplying a second gasket sheet comprises supplying a gasket sheet having
15 a plurality of prefabricated openings.

36. The method according to claim 35, wherein the step of positioned the MEA onto
the first gasket sheet comprises positioning the MEA onto a location on the first gasket sheet
substantially over the hole.

37. The method according to claim 34, further comprising:
prior to the step of positioning the MEA onto the first gasket sheet, punching a hole into
the first gasket sheet, wherein the hole has at least one dimension that is smaller than a
corresponding dimension on the MEA.

38. The method according to claim 37, wherein the step of positioning the MEA onto
the first gasket sheet comprises positioning the MEA onto a location on the first gasket sheet
substantially over the hole.

39. The method according to claim 34, further comprising:
prior to the step of positioning the second gasket sheet onto the MEA, punching a hole into the second gasket sheet, wherein the hole has at least one dimension that is smaller than a corresponding dimension on the MEA.

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40. The method according to claim 39, wherein the step of positioning the second gasket sheet onto the MEA comprises positioning the second gasket sheet onto the MEA such that the hole is substantially over the MEA.

10 41. The method according to claim 34, wherein the steps of supplying the first gasket sheet and supplying the second gasket sheet comprise supplying a first gasket sheet having an adhesive layer and supplying a second gasket sheet having an adhesive layer.

15 42. The method according to claim 34, further comprising:
prior to the step of positioning the MEA onto the first gasket sheet, applying an adhesive layer to the first gasket sheet; and
prior to the step of positioning the second gasket sheet onto the MEA, applying an adhesive layer to the second gasket sheet.

20 43. The method according to claim 34, further comprising:
cutting the adhered first gasket sheet, MEA, and second gasket sheet into one or more sections to form one or more substantially planar fuel cell arrangements.

25 44. The method according to claim 43, further comprising:
bending one or more of the cut sections to form one or more substantially stacked fuel cell arrangements.